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ABSTRACT

Curriculum mapping activities can be useful in analyzing curriculum goals and planning curriculum revision. This document is specifically designed using the Science Education Curriculum Goals articulated by the State of Oregon for grade 11. The goal areas include concepts, processes, manipulative skills, interests, values, interactions and characteristics. Information gathered using this document include: (1) amount of instruction; (2) degree to which instruction is included in course goals; (3) adequacy of texts and supplementary materials; and (4) adequacy of teacher training for each goal. The instrument is set up as a grid. (CW)

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ED309090

# SCIENCE EDUCATION

## Common Curriculum Goals

## Curriculum Mapping

### End of Eleventh Grade

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## USE OF THIS DOCUMENT

This document is provided for your convenience. Curriculum mapping is not a required activity. However, you will find that information obtained in this process will be helpful in analyzing your current curriculum in terms of the Science Education Common Curriculum Goals and planning for curriculum revision.

INSTRUCTIONS

Use of this document to gather information

1. Decide on questions to be asked. Some questions are provided in the column headings. You may wish to add or delete column headings.

2. Items underlined are unique to the Science Education Common Curriculum Goals or indicate that a change has occurred in the wording of an Essential Learning Skill.

3. Determine who will respond to the survey and under what conditions.

4. Reproduce the document and provide staff orientation and training.

5. Clarify intent of column headings and numeric scores.

Amount of Instruction:

Considerations here include amount of time and quality of instruction and feedback provided to students on the skill. Practice or application by instruction.

Included in Course Goals:

To be considered here is the degree to which the current local course goals reflect a particular common curriculum goal.

Adequate Materials:

Considerations here include the quality and the quantity of instructional equipment and apparatus. Also, the quality and quantity of teacher resources available for teachers planning. Concerns about sufficient materials for each student or teacher should be reflected in the comment section and in the score.

Ratings: 0 = absence or a complete lack of the item specified in the column heading.
1 = a low or inadequate amount or quality of the specified item.
2 = a moderate or reasonably satisfactory amount or quality of the specified item.
3 = a high or substantial amount or quality of the specified item.

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Adequate Teacher Training:

Considerations here include teacher preservice, inservice, college courses, workshops, personal reading and experiences which provice the teacher with the necessary skills to teach toward the specified goals.

Blank Column:

This column is provided for questions that you would like to add.

Comments:

Encourage teachers to use this section to clarify their ratings or express related concerns.

Use of this document to tally results

Results can be tallied in the space provided above numeric scores on an unmarked form. Consideration should be given to tallying by grade level or course title.

Use of this document to analyze results

An additional unmarked document can be used to display results across grades or courses for analysis and decision-making. Data could be displayed in a numeric average, as a compilation of all ratings, with a word descriptor (such as low, medium, high), or symbolically, using color coding.

SCHOOL: _____

| ASSIGNMENT:<br>6 ___ 8 ___<br>7 ___ Course _____<br>End of Eleventh Grade | Amount of Instruction | Included in Course Goals | Adequate Materials: Basal Text | Adequate Materials: Supplementary | Adequate Teacher Training | | COMMENTS |
|---|---|---|---|---|---|---|---|
| 1.0 Concepts. Students apply an understanding of fundamental concepts on which science is based.<br><br>STUDENTS WILL BE ABLE TO: | | | | | | | |
| 1.1 Demonstrate CAUSE AND EFFECT: Related series of two or more events that lead one to believe that nature is predictable (e.g., acid rain affecting plant growth, changing the temperature of a material, chemical reactions)* | | | | | | | |
| b Demonstrate an understanding of factors involved in a cause and effect relationship by predicting the outcome of interacting events | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Identify relationships and regularities from which a general statement can be made about the effects of change (e.g., time increase increases reaction rate) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.2 Demonstrate CHANGE: The process of things becoming different over time (e.g., aging, growth, metamorphosis, fire, mountains breaking up) (ELS 6.1)** | | | | | | | |
| a Relate various examples of change in an environment (e.g., biophysical, geophysical) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

0 = absence 2 = moderate
1 = low 3 = high
*Items changed from, or not included in, Essential Learning Skills.

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|---|---|---|---|---|---|---|---|
| b Defend conclusions, based on own previous observations or experiences, about interactions of two or more things or ideas | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.3 Demonstrate CYCLE: A pattern in which events or conditions repeat at regular or irregular intervals (e.g., day and night, seasons, reproductive cycles, nitrogen and carbon cycles) | | | | | | | |
| a Describe various examples of cycles in the environment or within organisms | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.4 Demonstrate ENERGY-MATTER: Mutually convertible equivalents ("stuff") from which the universe is made. Matter contains energy in many forms (e.g., states of matter are determined by energy in motion, nuclear energy comes from the nucleus when atoms split or fuse) | | | | | | | |
| a Describe and demonstrate how technology utilizes the scientific tenets of the relationship between energy and matter (e.g., nuclear medicine, active solar storage units, electric motor) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Describe the relationship between energy sources and conversions | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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|---|---|---|---|---|---|---|---|
| 1.5 Demonstrate ORGANISM: A system living or once living characterized by the processes of life (e.g., plants and animals; unicellular/bacteria) | | | | | | | |
| a Measure the effect that one life process has on another (e.g., respiration on locomotion) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.6 Demonstrate POPULATION: A group of structural or functional units that have specific or common characteristics (e.g., organisms) | | | | | | | |
| a Use basic population dynamics to explain and predict current and future problems | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Describe environmental effects and population interaction effects that result in predictable population changes | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.7 Demonstrate EQUILIBRIUM: A state of balance of equality between opposing forces (e.g., seesaw, diffusion of molecules from high to low concentration) after rates reach a balanced state | | | | | | | |
| a Demonstrate an understanding of equilibrium in various setting, (e.g., physical, biological, geological) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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|---|---|---|---|---|---|---|---|
| 1.8 Demonstrate EVOLUTION: A series of changes that can be used to explain how something has become the way it is or to predict what it might become (e.g., simple animal and plant forms to more complex forms) | | | | | | | |
| a Identify, predict and experiment with the factors that relate to evolutionary change in a situation (e.g., organism, environment) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Distinguish between human-directed changes and natural processes (e.g., designed automobile styles vs. natural selection in living organisms) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.9 Demonstrate FORCE: A push or pull against resistance which causes action, inaction or change (e.g., catapult, gravity, change the speed or direction of motion, stop motion) | | | | | | | |
| a Develop and explain a model which demonstrates the concept of force (e.g., lift on an airfoil, rocket's effect on direction of flight in outer space | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.10 Demonstrate FUNDAMENTAL ENTITIES: Units of structure and function useful in explaining phenomena (e.g., organism in populations, methods of measurements) | | | | | | | |

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|---|---|---|---|---|---|---|---|
| [a] Recognize and use appropriate fundamental units to explain structure and function of an object or system in an event | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.11 Demonstrate INTERACTION: Two or more things influencing each other (e.g., population/food, hot/cold, acid/base, force/movement, volume/pressure) | | | | | | | |
| [a] Identify levels of interactions within a complex system | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [b] Describe the relationship between variables in a system | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.12 Demonstrate ORDER: The tenet that there is order in nature or that order can be described in the various schemes or patterns of nature (e.g., periodic table, tides, sunrise/sunset) | | | | | | | |
| [a] Construct and use a dichotomous key which illustrates order | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.13 Demonstrate QUANTIFICATION: A number and unit resulting from a measurement of some real or abstract thing, situation or event (e.g., distance, time, mass, metric system (meter/second/gram), density, solubility, probability) | | | | | | | |

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|---|---|---|---|---|---|---|---|
| [a] Analyze data to draw conclusions and make predictions | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [b] Create appropriate data tables to collect and organize data | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [c] Demonstrate an understanding of measurement error (e.g., ±0.5) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.14 Demonstrate SYSTEM: A set of parts that function together as a whole. The parts can be discussed or studied individually for more effective learning (e.g., parts of a flower, digestive system of the body, electric motors) | | | | | | | |
| [a] Examine systems to determine the effects of interaction between/among the parts | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.15 Demonstrate THEORY: A plausible or scientifically acceptable explanation made up of models, concepts, and principles of some observed thing, phenomenon or thought (e.g., development of earth, atom, universe) | | | | | | | |
| [a] Use a theory to explain relationships between several objects or events | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [b] Evaluate strengths and weaknesses of various scientific theories | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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|---|---|---|---|---|---|---|---|
| 1.16 Demonstrate FIELD: A region around something that influences some other thing often without touching (e.g., magnetic, electrical, gravitational) | | | | | | | |
| [a] Develop and explain a model which demonstrates the concept of field | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.17 Demonstrate GRADIENT: A situation in which the intensity of something increases or decreases in a more or less regular pattern (e.g., temperature changes as distance from heat source is varied, stream flow, light intensity changes as distance from light source is varied) | | | | | | | |
| [a] Use concept of gradient to predict from existing data | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [b] Measure and graph the results of an experiment to illustrate gradient | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.18 Demonstrate INVARIANCE: A characteristic of an object or a situation which stays constant even though other characteristics may change (e.g., number of protons in nucleus, life (time related), total mass in chemical reaction) | | | | | | | |
| [a] Explain invariance in a system | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| 1.19 Demonstrate MODEL: Proposed idea of the composition and relationships present in something that cannot be observed directly (e.g., black box, black hole) | | | | | | | |
| a Explain and evaluate a model | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Use a model to make a prediction | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Develop a model to explain the function or structure of a phenomenon | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.20 Demonstrate PERCEPTION: The mind's interpretation of sensory input (e.g., illusions, use of sensory limitations to extend perception of scientific equipment) | | | | | | | |
| a Describe and demonstrate how an instrument can be used to modify perception (e.g., microscope) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.21 Demonstrate PROBABILITY: An expression of the likelihood that a situation or event will occur (e.g., flipping coins for heads or tails, cards, numbers, genetics, types of organisms, earthquakes, electron orbits) | | | | | | | |
| a Apply basic principles of probability to predict outcome of events | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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|---|---|---|---|---|---|---|---|
| b Describe and illustrate statistical significance | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.22 Demonstrate REPLICATION: Repeating the same condition in expectation that the same results will be produced (e.g., same soil condition produces same size plant, same ingredients in same product) | | | | | | | |
| a Design an experiment to replicate results | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Explain why different individuals, doing the same experiment may not get the same results | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Explain and use statistical means to evaluate accuracy and precision (e.g., standard deviation) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.23 Demonstrate SCALE: The understanding that characteristics may change as a system's dimensions are increased or decreased (e.g., maps, globes, models of cars or planets, or houses) | | | | | | | |
| a Explain the change of a variable's effect on a system as a result of a change in scale | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Predict changes that will occur as a result of change in scale | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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|---|---|---|---|---|---|---|---|
| 1.24 Demonstrate SYMMETRY: Structurally balanced (e.g., snowflakes, airplane body, right and left side of human body, sphere) | | | | | | | |
| a Demonstrate how symmetry in given situations relates to design and function | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Discuss symmetry relative to growth patterns | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 1.25 Demonstrate TIME-SPACE: The timing of an event moving from point A to point B (e.g., mph or km/h, automobiles separated by space of 3 seconds, velocity or vector, speed of nerve impulse) | | | | | | | |
| a Demonstrate ability to accurately time events during investigations | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Demonstrate rate of change (e.g., speed, reaction rate, growth) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Graph time/space relationships | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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|---|---|---|---|---|---|---|---|
| 2.0 Processes. Students apply problem solving and inquiry processes. | | | | | | | |
| STUDENTS WILL BE ABLE TO: | | | | | | | |
| 2.1 OBSERVE: Make accurate observations of objects and events using the senses or instruments to aid the senses* (ELS 4.1)** | | | | | | | |
| a Separate pertinent observations from extraneous observations in an investigation | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Use appropriate instruments to refine quantitative and qualatative observations | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.2 MEASURE: Use measuring devices to collect data (ELS 1.7) | | | | | | | |
| a Evaluate quantities that depend on more than one variable (e.g., density, pressure, velocity, momentum) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Identify limitations placed on an investigation by the measuring devices, senses, and techniques used | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Recognize the use of special scales in science which may be used in everyday life (e.g., Richter, pH) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| 2.3 USE NUMBERS: Use number/ numeric figures, letters, words, symbols and visuals to count, compute and communicate quantitative data (ELS 1.4) | | | | | | | |
| [a] Use mental, manual, calculator and computer processes to perform grade-level mathematical operations in reporting scientific information and conducting scientific investigations | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [b] Design tables, charts, and graphs to show the relationship among variables (ELS 1.6) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.4 RELATE TIME-SPACE: Describe spatial relationships and their change with time (ELS 1.6) | | | | | | | |
| [a] Describe spatial relationships and their change with time (e.g., velocity, acceleration) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.5 INFER: Recognize, construct and draw inferences concerning relationships among things and ideas (ELS 6.1) | | | | | | | |
| [a] Develop alternative inferences from observations which could become hypotheses | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.6 CLASSIFY: Use the characteristics of objects or events to group them by ordering similarities (ELS 6.1) | | | | | | | |

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| [a] Develop and use a classification system for organizing data | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [b] Identify and sequence (seriate) data by value (ELS 1.6) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.7 DEFINE OPERATIONALLY: Use the common characteristics of sets of objects or events observed or experienced to develop definitions of those objects or events | | | | | | | |
| [a] Use additional data to refine an operational definition | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.8 QUESTION: Identify problems and develop testable questions relating to the problems (ELS 6.3) | | | | | | | |
| [a] Identify a problem which may have a solution; generate and evaluate information critical to the solution of the problem | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [b] Develop testable questions which may contribute to the solution of a problem (ELS 2.3) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.9 HYPOTHESIZE: Use information and questions to generate statements that describe expected results of investigation (ELS 6.2) | | | | | | | |

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| [a] Use information and questions to generate testable hypotheses | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [b] Differentiate hypotheses that can be tested quantitatively from those that are limited to qualitative tests | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.10 DESIGN EXPERIMENTS: Plan and conduct data gathering operations to test hypotheses or answer questions (ELS 6.3) | | | | | | | |
| [a] Design a procedure to test a hypothesis | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [b] Select and apply the most appropriate tools, methodologies, processes and operations in solving a variety of problems | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [c] Engage in cooperative problem solving and common alternative solution strategies | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| [d] Analyze the formative and summative data to confirm or revise the proposed solution | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.11 CONTROL VARIABLES: Identify and manage factors that may influence an experiment (ELS 3.1) | | | | | | | |
| [a] Design methods for controlling selected variables | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| b Synthesize information and draw conclusions | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.12 INTERPRET DATA: Find patterns or meanings in experimental results (ELS 3.1, 6.2, and 6.4) | | | | | | | |
| a Recognize a pattern or other meaning inherent in a collection of data which leads to stating a generalization or developing a hypothesis | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Interpret discrepancies or correspondence between anticipated results (hypotheses) and actual results of an investigation they have performed (ELS 6.2) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Synthesize information and draw conclusions (ELS 3.1) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.13 PREDICT: Use information and data to generate and test predictions (ELS 1.6 and 6.2) | | | | | | | |
| a Establish confidence levels for accepting or rejecting predictions (ELS 1.6, 3.1 and 6.2) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.14 FORMULATE MODELS: Use problem solving and questioning skills to develop mental models that explain phenomena (ELS 6.3) | | | | | | | |

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|---|---|---|---|---|---|---|---|
| a Describe a closed interacting system based on observation and tests (e.g., a closed box system) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Use simulations to show changes in demographics (e.g., computer models, change in populations) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 2.15 COMMUNICATE: Use a variety of techniques to share the results of investigations (ELS 1.6 and 2.3) | | | | | | | |
| a Present and explain the results of investigations to groups, using oral, written, and visual (e.g., graphs, charts) communication skills (ELS 1.6 and 2.3) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| 3.0 Manipulative Skills. Students use a variety of materials and equipment in a safe and scientific way. | | | | | | | |
| STUDENTS WILL BE ABLE TO: | | | | | | | |
| 3.1 CONSTRUCT: Set up, shape or build the equipment and apparatus necessary for scientific activities (e.g., grid squares, microscope slides, glassware)* | | | | | | | |
| a Select, assemble, or construct equipment or apparatus to conduct a science activity | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 3.2 HANDLE MATERIALS: Demonstrate the proper safe use and maintenance of laboratory equipment and materials (e.g., pointed scissors, safety glasses, microscopes, chemicals, power tools, living materials, models, measuring devices) | | | | | | | |
| a Use proper techniques when handling equipment and disposing of hazardous materials | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Use appropriate safety equipment (e.g., clothes, eye protection, fire control equipment) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Demonstrate proper technique in use of all laboratory apparatus (e.g., microscope, buret, electronic balance, voltmeter) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| 3.3 PRACTICE BEHAVIOR: Practice appropriate and positive health behaviors to enhance learning (ELS 7.4)** | | | | | | | |
| a Apply information and skills concerning substance use which will enhance physical and mental performance (e.g., using laboratory measuring devices, handling chemicals) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| 4.0 Interests. Students develop interest in science. | | | | | | | |
| STUDENTS WILL BE ABLE TO: | | | | | | | |
| 4.1 Develop vocational and avocational interests in science by using many sources (e.g., media, organizations, conducting own research activity in and beyond the classroom)* (ELS 7.2)** | | | | | | | |
| a Locate and use reference materials (e.g., books, periodicals, newspaper, observations of nature, television, museums, exhibits, personal interviews, computer accessed data bases) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Use library classification system and services to locate specialized resources (e.g., people with expertise, print and nonprint, places of interest and information) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Identify science courses and resources which will enhance vocational and avocational interests | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 4.2 Recognize words and symbols commonly used in written materials (ELS 1.1) | | | | | | | |
| a Recognize common words and symbols found in written materials | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| b Define operationally common science terms related to science concepts | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 4.3 Determine meaning of unknown words and symbols commonly used in instructional materials (ELS 1.2) | | | | | | | |
| a Use concrete (hands-on) experiences as a basis for determining meaning of terms | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Use standard and scientific dictionaries, glossaries, handbooks and definitions in footnotes to find word meanings | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Utilize affixes and root words in understanding meaning of scientific and technological terms | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 4.4 Use instructional materials as basis for gaining knowledge and improving comprehension (ELS 2.2) | | | | | | | |
| a Use and interpret a variety of written resources (e.g., charts, graphs, tables) to locate information needed | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Use organization of materials (summaries, headings and review questions) for preview and review | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| | | | Basal Text | Supplementary | | | |
| c Use current technology (e.g., video tape, computer accessed data bases, video discs) to locate information needed | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| 5.0 Values. Students apply the values that underlie science. | | | | | | | |
| STUDENTS WILL BE ABLE TO: | | | | | | | |
| 5.1 Recognize that seeking knowledge and understanding is a worthy investment of time and resources* (ELS 6.2 and 6.3)** | | | | | | | |
| a Apply knowledge and understanding in new situations | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Analyze explanations and interpretations to confirm or validate them | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 5.2 Question information and ideas by determining their significance and accuracy as presented in written, oral, aural and visual communications (e.g., listening, reading, viewing, evaluating presentations of mass media) (ELS 4.4 and 6.4) | | | | | | | |
| a Distinguish between relevant and irrelevant information used to draw conclusions | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Critically evaluate arguments or positions in terms of known facts (ELS 6.4) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Evaluate the significance and accuracy of information | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| d Distinguish between non-science and the unknown or unanswerable | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| e Listen, read and view critically (ELS 4.4) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| f Evaluate roles of mass media in society (ELS 4.4) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| h Identify appropriate types of information (e.g., qualitative, quantitative) that should be included in simple forms of communication | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| i Evaluate whether a simple written or oral conclusion is consistent with known facts | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| j Recognize elements and use of propaganda techniques found in audio, printed and visual communications (ELS 4.4) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 5.3 Recognize the importance of systematically acquiring and ordering data as the basis for scientific explanations and theories (ELS 6.4) | | | | | | | |
| a Recognize the need for systematic and exact explanation over a nonscientific explanation | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Explain the value of data in supporting a scientific explanation | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| 5.4 Recognize that scientific explanations must be replicable (e.g., supporting evidence obtained by other investigators working in differnt places at different times under similar conditions) and made public in order to be accepted as valid (ELS 5.3) | | | | | | | |
| a Seek ways of verifying ideas through experimentation and research | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Evaluate, on an ongoing basis, the strengths and weaknesses of ideas and theories based on new information | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Explain the importance of validation of scientific explanations and possible consequences if this did not occur | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 5.5 Apply logic by reflecting upon and improving own reasoning (ELS 6.6) | | | | | | | |
| a Present arguments supporting the use of deductive or inductive reasoning for a particular purpose | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Evaluate when bias, inconsistency or other weaknesses affect reasoning | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Defend position when criticized by an authority who is biased | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| 5.6 Recognize the importance of considering the consequences (e.g., possible, actual) of investigations and actions before deciding to continue, change, or stop the process | | | | | | | |
| a Evaluate the consequencs of action taken | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Recognize the value of predicting consequences of action taken | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Determine if action should continue with a given scientific study after considering the possible consequences (e.g., hydrogen nuclear fission, genetic engineering, human clothing) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| 6.0 Interactions. Students describe interactions among science, society, technology and earth's environment. | | | | | | | |
| STUDENTS WILL BE ABLE TO: | | | | | | | |
| 6.1 Describe how society influences science and technology* | | | | | | | |
| a Describe how society's support influences science and technology | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Describe why it can be important for society to support pure scientific research which has no apparent or immediate application, but simply seeks to find answers to questions or test hypotheses | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 6.2 Describe how science and technology influence society | | | | | | | |
| a Identify examples of how scientific knowledge has helped in the solution of societal problems | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Recognize how individual wants and needs are positively and negatively influenced by technology | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Describe specific scientific and technological developments and how they have positively affected society | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| 6.3 Recognize the limitations as well as the usefulness of science and technology in advancing human welfare | | | | | | | |
| a Recognize that data is being generated faster than it can be applied | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Predict ways in which science and technology may advance human welfare | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 6.4 Describe and predict the effects of science, society and technology on the earth's environment and its ability to support all forms of life | | | | | | | |
| a Describe how specific scientific and technological advances have affected the earth's environment and predict how continued use or development may affect humans and other organisms | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Describe the difficulties involved in predicting the environment changes associated with scientific and technological advances | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 6.5 Evaluate the explanations by scientists, needs of society and possible impacts on the earth's environment to make responsible personal decisions regarding the uses of technology (ELS 6.4 and 6.5)** | | | | | | | |

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| a Describe applications of technology and decisions entailed in its use | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| b Analyze authoritative data to determine what optional positions are possible on a specific issue | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| c Assess the worth of a given course of action or policy after considering its possible impacts on individual, society and the earth's environment (ELS 6.4) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| d Formulate, support and defend a position based upon data gathered from objective and authoritative sources (ELS 6.5) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| e Support another person's position on an issue (e.g., through role playing, structured controversy techniques) (ELS 6.5) | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |

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| 7.0 Characteristics. Students describe the characteristics of scientific knowledge. | | | | | | | |
| STUDENTS WILL BE ABLE TO: | | | | | | | |
| 7.1 Describe the tentativeness of scientific knowledge (i.e., notion that it is subject to change, not truth in an absolute and final sense)* | | | | | | | |
| [a] Identify change agents in examples (e.g., discoveries) of historic changes in scientific theories | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 7.2 Explain the importance of objectivity and subjectivity in scientific thought, including similarity of conclusions reached by different individuals from the same information | | | | | | | |
| [a] Create options from collected data to test solutions for a problem | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |
| 7.3 Analyze scientific predictions and explanations for their probability (i.e., science permits reasonable but not certain predictions and explanations) | | | | | | | |
| [a] Determine if a solution associated with a science/technology/society problem is appropriate | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 | |



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